

Summary

Heavy vehicles and traffic accidents – Norway versus other European countries

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Norway is among those countries in the world with the highest traffic safety standards. Despite this, there is a 35 percent higher risk per capita of dying in an accident involving a heavy vehicle, when compared with the European average. A heavy vehicle is involved in every third traffic fatality in Norway, which is double the corresponding share for other European countries on average. The percentage reduction in the number killed in accidents with heavy vehicles over recent years is also less in Norway than in many other countries. When the fatality risk is measured per truck kilometer driven, however, Norway appears to rank just below the average level for other European countries. Dispersed business locations and a strong economy have led to increased heavy goods traffic on Norwegian roads, which are characterized by many curves and a lack of physical division between opposing driving lanes. This is the most important explanation for the relative high level of killed per capita in road accidents involving heavy vehicles in Norway.

The report gives an overview of the risk factors associated with the use of heavy vehicles on Norwegian roads. A comprehensive and coordinated effort is proposed using a range of countermeasure domains, with increased use of technology as a consistent theme: 1) Transfer of cargo transport to sea and rail, 2) More predictable and forgiving road design, 3) Improved traffic regulation in unpredictable and deviant traffic environments, 4) Stricter inspection of the stability of heavy vehicles, 5) Better co-ordination of supervisory and 6) Increased use of driver support systems.

Background and method

Heavy vehicles² are often involved in fatal road accidents, and the Norwegian Public Roads Administration (NPRA) has received informal reports that the share of killed in accidents involving heavy vehicles may be higher in Norway than in other European countries. On the basis of this, NPRA wanted to formally investigate whether accidents with heavy vehicles are more of a problem in Norway than they are in other countries. In the case that differences were found, they also wanted to know what those differences were, in order to learn about the potential for improving the road traffic safety of heavy vehicles in Norway and about the different measures that could be taken.

To compare the accident situation in Norway and Europe, we used data on accidents involving buses and heavy goods vehicles (HGVs) from the common European accident database (CARE) for the ten-year period spanning 2004 - 2013. These data were combined with exposure data based on population figures and traffic volumes in the different countries in order to obtain risk estimates. Potential measurement errors, different definitions of vehicle types and the number of kilometers driven in the different countries means that some of the results obtained from these data should be interpreted with caution.

² With heavy vehicles, we mean trucks, lorries, tractor-trailers and buses. This is further defined in Chapter 2.2 (in Norwegian).

Accidents involving heavy vehicles in Norway are studied in more detail, mainly using the official accident statistics from Statistics Norway (SSB), NPRA’s in-depth analyses of fatal accidents, and studies performed by the Accident Investigation Board Norway. We apply a risk-based and systemic approach to uncover the most important risk factors and from this find suitable solutions for safety improvements.

Accident situation

More die per capita in Norway in accidents involving heavy vehicles

Norway is among those countries with the fewest traffic fatalities overall, but for heavy vehicles the situation is different. Norway has about 35 percent more fatalities per capita occurring in accidents involving heavy vehicles when compared with the average in Europe, and for every three traffic fatalities a heavy vehicle is involved. This proportion is twice as high as in Europe. There is a downward trend in the number of people killed in heavy vehicle accidents in recent years, as for all types of traffic accident, but the percentage reduction in Europe overall has been twice as large as it has been in Norway. In 2014, 119 people were killed or seriously injured in accidents involving heavy vehicles in Norway. The number killed in truck accidents are generally five times as high as in bus accidents, and this report focuses therefore mainly on truck accidents.

The amount of freight transport on Norwegian roads has increased considerably in recent years, and is larger than it is in many other countries. Measured per truck kilometer, the fatality risk for trucks in Norway appears to be slightly below the European average. Serious collisions with heavy vehicles are concentrated in the highly trafficked section of the road network, but about 40 percent of these accidents occur on county roads.

Figure S 1 shows the number of people killed in heavy vehicle accidents per capita for each of 23 European countries, as well as the overall average for these countries.

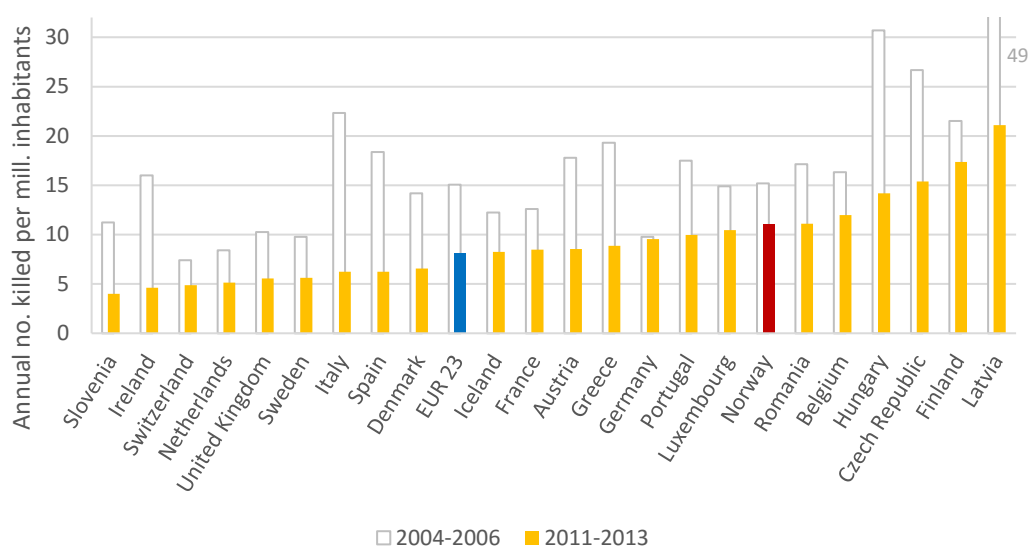


Figure S 1: Development of fatalities in heavy vehicle accidents in 23 European countries. Period 2011-2013 compared with 2004-2006.

In Figure S 1 we see that both Sweden and Denmark have about half as many killed per capita in heavy vehicle accidents than is the case in Norway, while Finland is among the European countries with the highest fatality rates for this type of accident.

Based on available exposure data, the distance driven in kilometers by motorized vehicles in Norway is ca. 6 % higher than the average for 15 other European countries. We did not find suitable exposure data for distance driven by buses, but the number of kilometers driven by truck in Norway has increased a lot in recent years, and seems to be high in comparison to many other European countries. The calculated fatality risk per truck kilometer indicates that Norway lies just under the European average level for accidents with trucks. However, the data that can be used to compare European countries on distance driven by trucks includes only domestic data, e.g. it does not include cabotage transport or transport destined for foreign countries. This introduces a level of uncertainty into comparisons of Norway and other European countries. An additional problem with expressing risk as fatalities per truck kilometer is that it fails to account for the varying distances covered by other road users in different countries, who are the ones most often injured in serious traffic accidents involving trucks. Given the available exposure data, we therefore consider the population risk to be a more reliable measure of risk. Nevertheless the traffic data indicate that relatively large transport volumes in Norway help explain the relatively high level of fatalities per capita in accidents with heavy vehicles.

As for other types of road accident, recent years have seen a downward trend in the number killed in accidents with heavy vehicles, but the percentwise reduction in Europe has been twice as large as has been in Norway. In 2014 there were 119 persons killed or seriously injured in road accidents with heavy vehicles in Norway. Out of those accidents with heavy vehicles, generally five times as many people are killed in those involving trucks than buses. We have therefore chosen to focus on heavy goods vehicle accidents in this report.

Head-on collisions dominate

Head-on collisions are the dominant accident type involving heavy vehicles in Norway. 70 % of the fatalities in accidents involving trucks occur in head-on collisions, and over half of those who die in head-on collisions die in collisions where heavy vehicles are involved. Heavy vehicles trigger "only" every twentieth fatal head-on collision on straight stretches of road, but every fifth such accident on curved stretches. Nine out of ten people dying in truck collisions are travelling in the counterpart car or van, and most are younger or middle-aged men.

15 percent of the fatalities in truck accidents were sitting in the truck at the time of the accident, and two-thirds of these sorts of accidents were run-off-road accidents. The decrease in accidents involving trucks is least for run-off-road accidents and for accidents involving semi-trailers. Foreign actors most often drive semi-trailers, are taking an ever larger market share of freight road traffic, and have a higher risk than Norwegian their counterparts. There is no evidence of any substantial reduction of fatalities in bus accidents.

Slippery, narrow and twisty roads

80 percent of truck accident fatalities occur in head-on collision and run-off-road accidents, and nearly half of these accidents occur in curves. Lane widths at the sites of about half of the accidents are so small that two trailer trucks would not be able to pass each other in the roadway. The conditions were slippery and/or wet for more than half of the head-on collision and run-off-road accidents.

Fewer vulnerable road users involved

There has been a particular reduction in the number of vulnerable road users, including moped and motorcycle riders, in truck accidents in recent years. The number of vulnerable road users killed per capita in truck accidents in Norway is half the corresponding average for Europe. Elderly pedestrians dominate the truck accident-involved vulnerable road users.

Risk factors

Since head-on collisions and run-off-road accidents account for four out of five people killed in accidents involving trucks, and since these accident types also dominate the bus accidents, we focus in particular on factors affecting such accident types. Figure S 2 depicts two scenarios that illustrate the factors and mechanisms most commonly found to trigger heavy vehicle accidents.

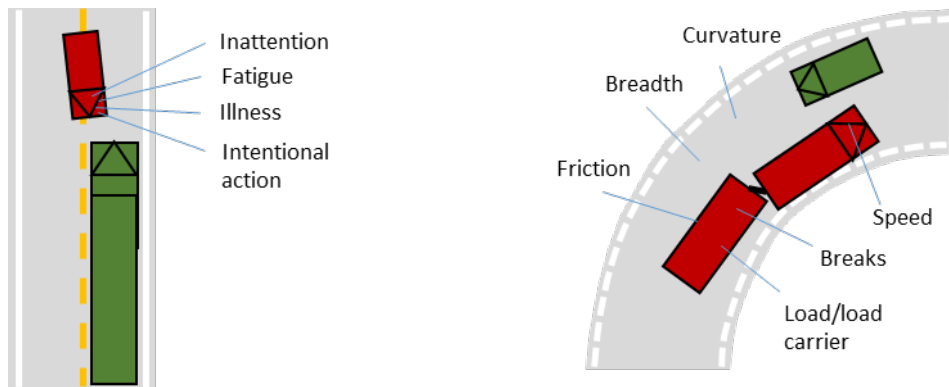


Figure S 2: Typical scenarios for triggering mechanisms in serious accidents involving heavy vehicles.

Drivers who fail to drive

Driving at high speed on roads with oncoming traffic requires that the driver is vigilant and active. Inattention and fatigue are among the most frequently mentioned factors behind heavy vehicle accidents. Drivers who are acutely ill also trigger accidents, but it is more difficult to be certain about this. These factors seem to appear more likely to the counterpart. Intoxication is part of the risk profile, and mainly concerns the non-professional drivers. We lack criteria for the classification of suicide in traffic, but it is estimated that between 7 and 18 percent of the fatalities in accidents involving heavy vehicles are the result of an intended action.

Vehicles that lose road grip

A large proportion of the serious accidents are caused by vehicles that lose traction. Speed, friction and road geometry affect this. Negotiating slopes and turns exposes vehicle weaknesses, where braking failures and poor load stability are prominent. Semi-trailers and vehicles with a high center of gravity are particularly prone to overturning. Small road widths reduce room for maneuver with respect to oncoming vehicles, and weak road shoulders reduce the ability to maintain control of vehicles running near or off the road edge.

High-energy collisions

Head-on collisions with heavy vehicles trigger large forces that often result in serious injury. Figure S 3 shows typical scenarios and risk factors influencing the seriousness of injuries in accidents involving heavy vehicles.



Figure S 3: Typical scenarios and factors of importance for injuries in serious accidents involving heavy vehicles.

Older cars offer less protection, but collisions with heavy vehicles at moderate speeds can be fatal even with new cars. Collisions at areas outside car's deformation zone located at the front increase the risk of death. In cases where the driver's cabin is relatively intact after an accident, failure or improper use of seat belts and other restraints are often crucial to the outcome. This applies to people in smaller cars and to the drivers and passengers in the truck and bus.

Employers failing to account for safety

Transport companies that fail to analyse the risks or attempt to improve safety through mitigating measures, often expose their drivers to a more demanding and dangerous work situation. Performance based pay systems and inadequate safety monitoring by the company can cause the driver to take more risks, both with their speed and need for rest.

Roads poorly adapted to the transport they carry

Large and heavy vehicles have particular stability characteristics and need straighter roads with more space and better capacity than smaller vehicles do. Requirements for road design, the evenness and friction of the road surface, and contractual requirements regarding the monitoring of contractors' winter operations, all means that the transporters have small margins. Readiness for a fire in a heavy vehicle in a single-road tunnel does not seem to be adequate enough to ensure rapid quenching or evacuation.

Traffic management challenges

Road environments with complicated driving lines and patterns increase the likelihood of accidents. Lack of clearly defined responsibility for safety in road work areas and other deviant situations can create demanding traffic environments, and communication failures between the road environment, road traffic center and road users can mean that critical information is not received.

Complex framework

The requirements for safety management in the road sector are fragmented and complex, creating challenges for a comprehensive road safety approach. The structure of safety management requirements for the road network is complicated, and the presence of many inspection and supervisory agencies makes coordination of the authorities' efforts in this area particularly challenging.

Six improvement strategies

Through an assessment of the potential of different safety measures, we have determined that the safety can be improved through a more coherent and coordinated approach within a spectrum of measures. Measures and combinations of measures can be implemented to reduce the need for road transport, to give greater control over the driving process, and to limit damage resulting from accidents. The use of technology is a common theme, and expanded use of technology can enhance safety effects. Improvements can be achieved with measures aimed at both professional transport and other road traffic. Figure S 4 summarizes the proposed measure areas.

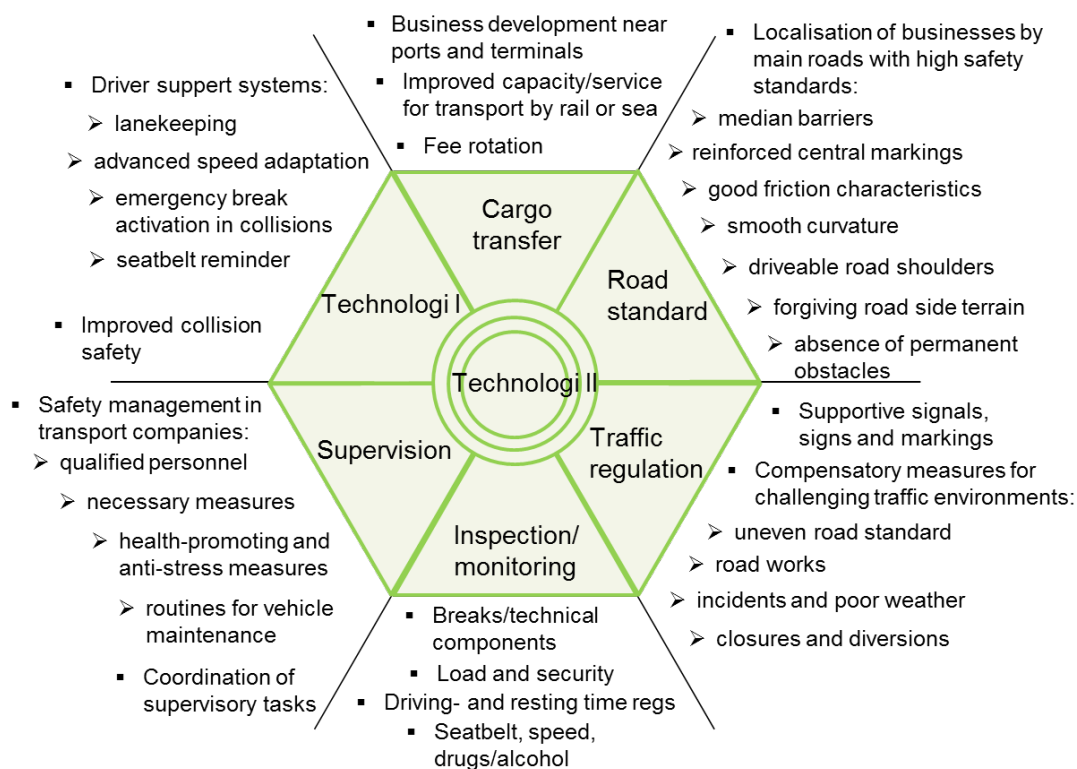


Figure S 4: Six proposed strategies for the reduction of serious accidents involving heavy vehicles in Norway.

There are different ways to obtain safety improvements, and each strategy has its limitations. In an assessment of the strategies' content and composition, the likely safety effects and costs of the measures involved must be considered.

It is calculated that a 25 percent reduction in HGV traffic will mean that the share of traffic volume in Norway conducted by HGVs will be on a par with other European countries. It is estimated that this would reduce fatalities in heavy vehicle accidents by 12 percent. A "realistic" introduction of middle barriers on the road network has a corresponding estimated effect of 20 percent. Measures in these two areas would bring the level of

fatalities in heavy vehicle accidents down to overall European levels. With these measures implemented the share of killed in heavy vehicles accidents will still be larger than the European average. This means that use of heavy vehicles represent a larger share of risk in Norway compared with other European countries.

The greatest potential for safety improvements is probably to be gained by increased use of technology. The combined use of available technologies would make it possible to automate the driving process to a larger degree and reduce the problem of human error. Meanwhile, increased use of information and communication technologies can simplify and increase the effectiveness of logistical solutions, traffic management, monitoring and other supervisory functions.

It is also recommended that suicide accidents and tunnel fires be incorporated into normal traffic safety work. These incidents are not currently included in the accident statistics, even though they are an important part of the risk profile.

Potential measure categories are further discussed and exemplified in a separate Working Document no. 51029.

Further research

There are limitations in the data available for comparing heavy vehicle accident rates in different European countries. Increased and consistent reporting on important standardized variables to the European accident database CARE, by all European countries, would lead to more descriptive and reliable results. Shortages in reporting of exposure variables to Eurostat also need to be addressed. In particular, there are variations in the way different European countries distinguish between vans and trucks, and the number of driven truck kilometers with foreign destinations are not included in the exposure data. Further research should therefore attempt to address these challenges and explore the possibility of consolidating our findings using alternative data sources, such as those from international haulage companies.